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# The relationship between the entrepreneur's personal network multiplexity and firm growth

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## ABSTRACT

The purpose of the paper is to develop a consistent measure of the entrepreneurs' personal network multiplexity and to analyse its relationship to firm growth. The research goals were achieved with a quantitative approach. The data were collected with a structured questionnaire delivered to micro and small firms in Slovenia. The research results confirmed the multidimensionality of the network multiplexity concept and showed that it may influence firm growth. Entrepreneurs' personal networks represent an important form of support during the entrepreneurial process, therefore they need to be efficiently and carefully managed by entrepreneurs.

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## 1. Introduction

The extensive body of research on entrepreneurial networks has confirmed that entrepreneurs acquire a great part of their support through their personal networks. Entrepreneurs establish and expand their personal networks by establishing and developing contacts in both their personal lives as well as in their professional career (such as, for example, participation at various conferences, meetings, social events, business cards exchange, and the like) (Aldrich, Rosen, & Woodward, 1987). Entrepreneurs thus rely on their personal and business contacts who may provide them with significant information and resources (Aldrich & Zimmer, 1986). In order to acquire the necessary support, entrepreneurs socially interact with their families, friends, suppliers, customers, and their business partners. The entrepreneurs' personal networks are thus represented by combinations of friendship, business and kin ties (Anderson, Jack, & Dodd, 2005) and provide entrepreneurs with a wide range of opportunities and support (Johannisson, 1986).

External resources are especially significant for many small firms with limited resources whose business performance depends on their ability to acquire external resources, which are essential for their growth (Partanen, Möller, Westerlund, Rajala, & Rajala, 2008). Networks were found to be a supportive and valuable asset for entrepreneurs (Bogren, von Friedrichs, Rennemo, & Widding, 2013). The relationship between networks and business

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performance was therefore addressed in several past studies (i.e., Hansen, 1995; Chell & Baines, 2000; Witt, 2004; Batjargal, 2006; Antončič, Ruzzier, & Bratkovič, 2007; Partanen et al., 2008; Bratkovič, Antončič, & Ruzzier, 2009). Hansen (1995), for instance, acknowledges that certain network characteristics, such as network size, number of ties, and contact frequency prior to the start-up, strongly influence the firm growth at the beginning of a new venture creation.

Our study is focused on network multiplexity as one of the main structural characteristics of social networks and its influence on firm growth. The research was conducted on a sample of 486 Slovenian micro and small-sized firms, since prior research showed that entrepreneurs' personal networks may influence the growth of especially micro-sized companies (Antončič et al., 2007).

The prior research confirmed the beneficial effects of network multiplexity on firm performance. Multiplex ties provide entrepreneurs with a specific kind of support and the appropriate employment of the latter can facilitate firm performance. As they are more reliable relationships, based on trust, multiplex relationships can provide entrepreneurs with greater support (Jack, Drakopoulou Dodd, & Anderson, 2008).

## 2. Research hypotheses

Multiplexity can be defined as a structural characteristic of social networks which measures the degree of tie overlaps (Scott, 1991). The concept in question was first introduced in the field of sociology. As a matter of fact, soon after the social network theory started to develop in the 1950s, sociologists and social anthropologists started to examine tie multiplexity (e.g. Verbrugge, 1979; Krohn, Massey, & Zielinski, 1988). The concept in question therefore relates to relationships existing within a social network.

Unlike uniplex relationships, which can be characterised as single-layered relationships that are based on a single-role relation, multiplex relationships comprise many roles (Barnes, 1972; Tichy, Tushman, & Fombrun, 1979; Aldrich, Rosen, & Woodward, 1986; Lee, 2001). A strictly kin relationship between two relatives can therefore be characterised as a uniplex tie (i.e. a single-role relationship). On the other hand, the individuals who are involved in multiplex relationships perform diverse roles, which indicates that they are mutually-related via diverse relationships (e.g. kinship, a business relationship). Thus, a multiplex relationship could be illustrated by a co-worker who also acts as a relative. The prior research showed that entrepreneurs emphasised the importance of their relationships with other network members via diverse roles (Boissevain, 1974). Multiplex ties were also characterised as ties where individuals are strongly aware of each other's needs (Verbrugge, 1979).

The various interpretations and definitions of multiplexity within entrepreneurial networks can be classified into three distinct dimensions: (1) multiple relationships among network members (Aldrich et al., 1986; Lee, 2001); (2) the overlap between social and economic dimensions of exchange (Streeter, 1989; Larson & Starr, 1993; Anderson et al., 2005); and (3) the degree to which two network members are mutually-related via multiple relationships (Birley, 1985; Aldrich & Zimmer, 1986; Larson & Starr, 1993). The three dimensions in question might also be perceived as the essential components of multiplex relationships.

Definitions of the three above-mentioned network multiplexity construct's dimensions are shown in Table 1.<sup>1</sup>

**Table 1.** The definitions of the network multiplexity construct’s dimensions.

The network multiplexity dimensions	Definition
Role multiplexity	The overlap of various types of roles performed by the network members.
Content multiplexity	The multiple content of exchange between entrepreneurs and their network members.
Degree multiplexity	The extent to which the entrepreneur is mutually-related to the other network members in terms of intensity and strength of relationships.

Source: Research result.

Based on the above findings and our expectations, the following hypothesis about the multidimensionality of the network multiplexity construct is formulated.

**Hypothesis 1.** Network multiplexity is a multidimensional construct that includes three dimensions: role multiplexity, content multiplexity, and degree multiplexity.

This hypothesis is then divided into three sub-hypotheses based on each construct dimension.

**Hypothesis 1a.** Role multiplexity represents a dimension of the network multiplexity construct.

**Hypothesis 1b.** Content multiplexity represents a dimension of the network multiplexity construct.

**Hypothesis 1c.** Degree multiplexity represents a dimension of the network multiplexity

The prior research confirmed the beneficial effects of network multiplexity on firm performance. Multiplex ties provide entrepreneurs with a specific kind of support and the appropriate employment of the latter can facilitate firm performance (Jack et al., 2008). Manning, Birley, and Norburn (1989), for example, found that the interconnectedness between personal, social and formal networks significantly influences the success of a new venture. Some studies have confirmed that close-knit networks are more likely to increase firm profitability (Aldrich et al., 1987), firm development (Shaw, 2006), and sales growth (Antončič, 2002a; Tuli, 2006). Moreover, the multiplexity of relationships between the suppliers and the customers was also found to reduce the volatility of sales (Tuli, 2006).

Based on the above findings and our expectations, we assume that the entrepreneur’s personal network multiplexity will positively contribute to firm growth. Therefore, the following research hypothesis is suggested.

**Hypothesis2.** The extent of the entrepreneur’s personal network multiplexity will be positively related to the extent of firm performance.

The purpose of the study is to develop a measure of the entrepreneur’s personal network multiplexity and analyse the relationship between network multiplexity and firm growth. Based on the above findings and our expectations, we assume that the entrepreneur’s personal network multiplexity is a multidimensional concept and will be positively related to firm growth.

### 3. Methodology

In order achieve the goals of the study a quantitative approach was undertaken. The data were collected through an online survey administered among entrepreneurs of selected firms in Slovenia. Since prior research showed that entrepreneurs’ personal networks may influence the growth of especially micro-sized companies, the sample population incorporated

micro-sized firms (employing 0–9 employees) and small-sized firms (employing 10–49 employees) (Antončič et al., 2007). The firms were selected from the Slovenian Business Register. The questionnaire was sent to 22,161 micro and small-sized firms, and a total of 497 responses were received, which represents a 2.24% response rate. Since 11 respondents did not comply with the requirements regarding the target population, the total effective sample incorporated 486 relevant responses. The average respondent in the sample was a 41-year-old married (81.9%) male (57.6%) with a university degree (52.5%) and with more than 10 or 20 years of work and entrepreneurial experience (30.2%). The majority of the entrepreneurs (76.96%) held top management positions, represented the major owners of the firms (68.8%), and also functioned as the sole founders during the start-up process (66.7%). The average firm was characterised as a micro-sized company (employing 0–9 employees, 89.51%), which had been in existence between two and five years (41.8%), operated in the service industry (73.1%), and whose sales totalled €500,000 or less (84.6%).

The measurement instrument, which was represented by a structured questionnaire, included different questions measuring network structure, network multiplexity, entrepreneur's socio-demographic characteristics, and the company characteristics. The designed measurement instrument considered the prior findings as well as the theoretical framework, which was developed in this study. Since network multiplexity was not strongly addressed in prior research, the development of measures was necessary.

The majority of the network multiplexity measures were perceptual since they were specific to the research subject and since they examined the personal views of the respondents. The network multiplexity dimensions were measured with 28 items. The analysis employed the five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The degree multiplexity dimension incorporated some questions related to the strength and intensity of relationships between entrepreneurs and their friends and the individuals who provide the entrepreneurs and their firms with invaluable resources and information. The role multiplexity dimension was measured with the items related to the overlap of various roles within the entrepreneurs' personal networks. The third network multiplexity dimension, content multiplexity, incorporated the questions related to content exchange between the entrepreneur and the network members. Firm growth was assessed with three measures, namely sales growth, growth of employees, and growth of market share. The dependent variable *Firm growth* was then measured as the average of these three items. The measurement instrument was pre-tested in two stages before submitting the questionnaire to the target population.

The collected data were analysed using univariate and multivariate statistical methods. The network multiplexity scale that was developed and employed in this study was examined for its convergent and discriminant validity with exploratory and confirmatory factor analyses (Hair, Black, Babin, Anderson, & Tatham, 2006). The exploratory factor analysis was conducted with the analytical computer programme SPSS statistical package (version 19) based on the number of factors that were anticipated on the basis of the research framework (i.e. three factors). The maximum likelihood extraction method and the oblique factor rotation method (i.e., oblimin rotation method) were employed in the exploratory factor analysis. The retained standardised measurement items were employed in the confirmatory factor analysis which was conducted using the EQS software.

The relationship between network multiplexity and firm growth was performed with the multivariate technique of structural equation modelling (SEM).

## 4. Results

The appropriateness of the data was examined prior to the exploratory factor analysis of the network multiplexity items. Barlett's test of sphericity showed that the correlation matrix is characterised by significant correlations (significant at 0.000 for all the items). The KMO measure of sampling adequacy possessed a value of 0.88, indicating a good level of adequacy of data.

Based on the prior research and our assumptions a three-dimensional construct of network multiplexity was proposed (i.e., degree multiplexity, role multiplexity, and content multiplexity – the a priori criterion), which would represent a consistent measure of multiplexity within entrepreneurs' personal networks. However, the empirical analysis on a sample of 486 Slovenian entrepreneurs revealed that a five-dimensional structure would best describe the concept of network multiplexity.

The number of factors retained was determined on the basis of three different criteria. The latent root criterion or eigenvalue suggested the extraction of five factors if the a priori criterion were absent. The second criterion, the scree plot, indicated the potential extraction of four factors. The percentage of variance criterion suggested the extraction of five factors (with the total variance explained above 60%). Therefore, both the five-factor as well as the four-factor solutions were examined. The analysis showed that the four-factor analysis was not as meaningful as that from its five-factor counterpart. In fact, the factors from the four-factor analysis were unidentifiable. Contrary to the initial expectations, five factors were extracted. However, the findings were somehow in accordance with our research framework since the content multiplexity dimension was found to be established by three dimensions, which resulted in the larger number of factors. The content multiplexity dimension was thus classified into three dimensions, i.e., the friends' content multiplexity, the business partners' content multiplexity, and the relatives' content multiplexity (see Table 2).

Each item of the five dimensions was examined in terms of its communality index and its contribution to the research. Owing to low communalities after the extractions and cross-loadings, seven items were excluded from the analysis. In total, 21 items were retained. The network multiplexity dimensions' item loadings ranged from 0.350 to 0.985.

In order to validate the findings of the exploratory factor analysis and to examine the convergence of the network multiplexity dimensions, a confirmatory factor analysis was conducted. The confirmatory factor analysis confirmed the results obtained with the exploratory factor analysis, indicating that the network multiplexity construct comprises five dimensions. All the items possessed positive, high and significant coefficients, and all five dimensional scales showed good reliability (i.e., Cronbach's alpha over 0.78, which is above the threshold of 0.60).

Each network multiplexity dimension's internal consistency was measured with the Cronbach's alpha coefficient, while the convergence was measured with the model's goodness-of-fit indices (Normed Fit Index-NFI, Non-Normed Fit Index-NNFI, Comparative Fit Index-CFI, Standardised Root Means Square Residual-SRMR, Root mean Square Error of Approximation-RMSEA). To summarise the research results, all the dimensions' items were positive, high and significant, thus indicating good convergence. The model fit indices demonstrated good model fit for each dimension.

The network multiplexity dimensions were tested for convergent and discriminant validity in the network multiplexity construct structural model where the dimensions were



**Table 2.** The definitions of the network multiplexity construct's dimensions (after exploratory factor analysis).

Proposed dimension	Definition	Construct dimension
Degree multiplexity	The extent to which the entrepreneur is mutually-related to the other network members in terms of intensity and strength of relationships.	Degree multiplexity
Content multiplexity	The multiple content of exchange between entrepreneurs and their friends.	The friends' content multiplexity
	The multiple content of exchange between entrepreneurs and their business partners.	The business partners' content multiplexity
	The multiple content of exchange between entrepreneurs and their relatives.	The relatives' content multiplexity
Role multiplexity	The overlap of various types of roles performed by the network members.	Role multiplexity

Source: Research results.

**Table 3.** The network multiplexity construct convergent and discriminant validity.

Dimension	Overall model*		Overall model**				
	Composite reliability	Composite reliability	DM	FCM	BPCM	RCM	RM
DM	0.786	0.587	1	0.571	0.575	0.420	0.465
FCM	0.814	0.571	0.571	1	0.580	0.563	0.607
BPCM	0.789	0.611	0.575	0.580	1	0.354	0.537
RCM	0.820	0.650	0.420	0.563	0.354	1	0.488
RM	0.786	0.587	1	0.571	0.575	0.420	0.465

\*Goodness-of-fit-indices: NFI=0.928, NNFI=0.932, CFI=0.942, SRMR=0.082, RMSEA=0.086.

\*\*All correlations were significant at 0.05.

Source: Research results.

modelled as first-order latent constructs and were correlated with each other. The reliability of the specific summated scales was measured by Cronbach's alpha. All five dimensions were modelled as first-order latent constructs and were correlated with each other. All the coefficients were positive, high and significant. Some model fit indices showed good model fit (NFI 0.928, NNFI 0.932, CFI 0.942), while SRMR (0.082) and RMSEA (0.086) were above the threshold value of 0.05, thus indicating poorer model fit. All the dimensions demonstrated good composite reliability with the values above the threshold of 0.70 (0.739 and more). The variance extracted (VE) was found to exceed the threshold value of 0.50 for four dimensions, except for the role multiplexity dimension where the variance extracted equalled the threshold value (0.501). The correlations among the dimensions were all positive and significant and two of them were slightly above the threshold value of 0.70 (0.695, 0.704, 0.736).

A summary of the results is presented in Table 3.

The multidimensionality of the network multiplexity construct was tested with the comparison of the relative contributions of the two models. The first model includes only one common network multiplexity first-order factor (i.e., the one common factor model). This model is based on the assumption of the unidimensionality of the network multiplexity concept. The second model represents the network multiplexity dimensions-only model, which is explained above. This model is based on the assumption of the non-unidimensionality of the network multiplexity concept. The two models were compared by nesting these models into one model, including both the dimensions and the common factor (Antončič, 2002b). The chi-square difference and the results for the Parsimony Normed Index were also

**Table 4.** The summary of the findings: the empirical testing of the hypotheses.

Hypotheses	Dependent variable	Independent variable	Standardised coefficient	Result
H1A	Network multiplexity	Role multiplexity	0.98*	Supported
H1B	Network multiplexity	Friends' content multiplexity	0.72*	Supported
		Business partners' content multiplexity	0.82*	
		Relatives' content multiplexity	0.64*	
H1C	Network multiplexity	Degree multiplexity	0.64*	Supported
H2	Firm growth	Network multiplexity	0.01*	Supported

\*The coefficients significant at the 0.05 level.

Source: Research results.

examined. The comparison between the two models showed that only the dimensions-only model contributes to the explanatory power (i.e., the Chi-square difference is significant). Furthermore, the Chi-square difference between the dimensions-only model chi-square value and the nested model chi-square value, showed negative values, which indicates that the one-common factor model does not possess any explanatory power. The latter strongly indicates the multidimensionality of the network multiplexity construct.

Based on the research results presented above, we can confirm Hypothesis 1, which predicted that network multiplexity is a multidimensional construct. However, instead of consisting of three dimensions as expected (role multiplexity, content multiplexity, degree multiplexity), the analysis showed that it consists of five dimensions (role multiplexity, friends' content multiplexity, business partners' content multiplexity, relatives' content multiplexity, degree multiplexity).

The predictive validity of the network multiplexity scale was measured by analysing its impact on firm growth (see Figure 1). In support of Hypothesis 2, which predicted a positive relationship between the entrepreneur's personal network multiplexity and firm growth, the coefficient for this relationship was found to be positive and significant (i.e., a coefficient of 0.01, standardised coefficient of 0.01, significant at 0.05 level). Although the strength of the observed correlation is weak, it is significant and in the expected direction. Therefore, Hypothesis 2 can be supported. The multiplexity of the entrepreneur's personal network might therefore increase firm growth.

A summary of the results is presented in Table 4.

## 5. Conclusion

In this study, the concept of the entrepreneur's personal network multiplexity was empirically tested for its multidimensionality and was related to firm growth. Since the prior research indicated that multiplex ties provide significant support for the entrepreneur and his/her firm, we aimed to determine whether there exists a positive relationship network multiplexity and firm growth.

The first contribution of the study is the development and empirical testing of a multi-dimensional construct of network multiplexity, which represents a research framework for the future research on entrepreneurial networks. The research results show that the network multiplexity construct incorporates five dimensions, i.e. the degree multiplexity, the role multiplexity, the friends' content multiplexity, the business partners' content multiplexity, and the relatives' content multiplexity. Contrary to our expectations, the empirical testing



of the model demonstrated that the content multiplexity dimension can be divided into three well-distinguished dimensions, i.e., the friends' content multiplexity, the business partners' content multiplexity, and the relatives' content multiplexity. In fact, the prior research showed that entrepreneurs' networks represent combinations of friendship, business, and kin ties (Anderson et al., 2005) and that they also incorporate combinations of normative, information, advice, economic and barter exchange (Shaw, 2006). Based on these findings, the division of content multiplexity dimension into three dimensions seems to be appropriately theoretically supported. The five-dimensional construct represents a consistent measure of entrepreneurs' network multiplexity and it shows good convergent and discriminant validity. The network multiplexity measure represents the main methodological contribution of the study.

The second contribution is related to the development of new expertise about the connection between the multiplexity of entrepreneurs' personal networks and firm growth, which could be relevant both in theory and practice. Since the past research in the field of entrepreneurial networks lacked the measure of network multiplexity, the impact of network multiplexity on firm growth could not be analysed in great detail. Therefore, the results of this study provide new knowledge regarding the research area of entrepreneurs' personal networks. Although in this study the relationship between network multiplexity and firm growth was found to be weak, it was significant and positive. A plausible explanation for a weak correlation between entrepreneurs' personal network multiplexity and firm growth might arise from the observation that the beneficial effects of networks might be seen only over time.

Based on the current study, some implications for practising entrepreneurs can be determined. The past research showed that personal networks represent an important form of support during the entire entrepreneurial process, therefore they need to be efficiently managed. Entrepreneurs and managers should be both aware of the importance of social capital (in terms of resources, information, and advice) which is embedded into their personal networks. Relationships that form entrepreneurial personal networks are dynamic and they evolve over time. In order to make these even more efficient in terms of support, they need to be appropriately managed. This implies that entrepreneurs should develop and maintain personal and business relationships more consciously. The results of this study showed that micro and small entrepreneurs rely on both personal and business contacts during the acquisition of the key resources for their firm growth and development. In the case of micro and small entrepreneurs it is difficult to distinguish personal contacts from business ones since both of these can support the business and since the level of their mutual interweaving is relatively high in contrast to organisational networks. For example, friends may morally support and encourage entrepreneurs as well as provide them with the key resources for their firms, which imply that relationships that form entrepreneurial personal networks are dynamic and they evolve over time. In order to make these even more efficient in terms of support, entrepreneurs should be familiar with the structure and the content of their personal networks and they should also appropriately nourish the relationships that are embedded in their networks.

Some limitations of this study need to be noted. The data were collected in a single country – Slovenia. The measures used in this study are exclusively perceptual. However, the perceptual measures represented a suitable method for measuring network multiplexity, since they are highly specific and provide an in-depth insight into the relationships within

the entrepreneur's personal network. Despite these limitations, we believe that the selected study design and methods were appropriate for achieving the study's goals and for making some important contributions.

Future research on entrepreneurial networks should be directed to an in-depth analysis of multiplex ties and its impact on firm performance. In addition to firm growth, other important dependent performance variables such as firm profitability, new value creation, internationalisation, and the entrepreneur's satisfaction with firm performance should be used. Moreover, studies employing a longitudinal research design and comparing findings cross-culturally could yield extra insights into the research area of entrepreneurial networks, in particular network multiplexity.

## Note

1. Due to the word limit of the paper, the conceptualisation of each of the three multiplexity dimensions is not shown.

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No potential conflict of interest was reported by the authors.

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